REMARKS

Claims 21-40 are pending in the application. Claims 1-20 have been previously cancelled.

Claims Rejections – 35 USC 103

Claims 21-22, 25-27, and 30-39 are rejected under 35 USC 103(a) as being obvious over Langer et al. (US 6,155,331) in view of Kriechbaum et al. (US 6,165,926).

Claims 23-24 and 40 are rejected under 35 USC 103(a) as being obvious over Langer et al. in view of Kriechbaum et al. and further in view of either Zoia et al. (US 6,609,043) or Smith et al. (US 6,354,362).

Claims 28-29 are rejected under 35 USC 103(a) as being obvious over Langer et al. in view of Kriechbaum et al. and further in view of Kington (US 4,989,667).

Basically, the Examiner has replaced previously cited Goldsmith with Kriechbaum et al.

As already discussed in the response to the previous Office action, Langer et al. disclose a ceramic casting mold, which is produced by a Rapid process and is in a not-sintered green state. The ceramic consists of molding sand, which is coated with heat-hardened resin binder. The mold strength is provided by the hardened binder, not by the sintering. Clearly, Langer et al. do not disclose

- sintering
- porous ceramic
- fine particles
- expansion coefficient

The Examiner appears to have ignored Applicants' remarks in the response to the previous Office action and has stated again incorrectly that Langer et al. teach about porous ceramic produced by selectively sintering. This is incorrect because Langer et al. teach explicitly a totally different solution "This process is basically different from the known sinter process ..." (see column 13, lines 20 ff). Furthermore, Applicants cannot find anything about porosity, fine particles or expansion coefficient in Langer et al. Maybe that is the reason why the Examiner has not mentioned anything about fine particles or expansion coefficient. It is noted that porosity is not possible with the Langer et al.' process and material because the curable binder fills any space between the filler particles and leaves no room for any porosity.

As already discussed in the response to the previous Office action, the object of the present invention is to guarantee a sufficiently good dimensional stability of the casting mold. This object is achieved by the additional application of fine particles, through which the temperature required for the sintering compound of the coarse particles is lowered, especially shrinkage is reduced.

Langer et al. disclose a totally different alternative solution, namely the compound of the particles, over which the heat-hardened resin binder is coated, is <u>not sintered</u>. This results over the prior art the advantage of reduced material shrinkage and warp (see column 13, lines 27-31).

Applicants have argued in the response to the previous Office action that Langer et al. have already solved the problem of the present invention – but in a different way. So there is no motivation for a person skilled in the art to look for another solution. It is noted that the Examiner has not made any comments about this argument.

Without motivation, a person skilled in the art would neither search for, nor find or use Kriechbaum et al.

Another reason why a person skilled in the art would not combine Kriechbaum et al. with Langer et al. is that the present invention and Langer et al. concern the production of casting molds with rapid prototyping, whereas Kriechbaum et al. concern a refractory composition and the making of refractory bodies. Accordingly, the IPC and the US Cl. for the two references are totally different.

Further, Applicants believe that a not permitted hindsight consideration presents when considering Kriechbaum et al. To justify this hindsight consideration, the Examiner has argued that Langer et al. fail to teach the use of a castable refractory composition. However, this has nothing to do with the problem or aim of the present invention which is to guarantee a sufficiently good dimensional stability of casting molds.

Even if a person skilled in the art would combine Langer et al. and Kriechbaum et al., the present invention would not result because there is no mention anywhere of a suitable expansion coefficient. The Examiner has argued that alumina particles have well known high thermal expansion coefficient of 8-10 $\times 10^{-6} K^{-1}$. This is incorrect because alumina ceramics have expansion coefficient from 3.1 to 3.7 $\times 10^{-6} K^{-1}$ (see the attachment).

Furthermore, the coarse particles with diameters from 1 to 60 mm in Kriechbaum et al. are far too coarse for rapid processes which normally use particles sizes between 50 and 200 µm.

In addition, the Examiner has stated that the fine particles in Kriechbaum et al. have well known lower sintering temperature of 200 °C below the coarse particles. Unfortunately this is not known to Applicants and the Examiner has no provided any citation from which he obtains this knowledge.

Finally, the Examiner is requested to consider all the remarks presented by Applicants to avoid the unnecessary economic burden of Applicants to have to make the same arguments again.

Withdrawal of the rejections and early issuance of a Notice of Allowance are respectfully requested. **Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.**

Respectfully submitted,

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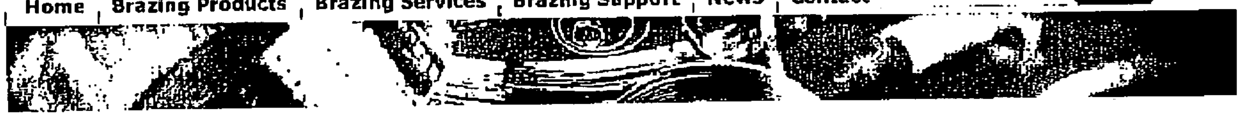

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Chart of COE's Coefficient of Thermal Expansion

Material	10^{-6} in./in.*/°F		10^{-5} in./in.*/°C	
	High	Low	High	Low
Zinc & its Alloys[c]	19.3	10.8	3.5	1.9
Lead & its Alloys[c]	16.3	14.4	2.9	2.6
Magnesium Alloys[b]	16	14	2.8	2.5
Aluminum & its Alloys[c]	13.7	11.7	2.5	2.1
Tin & its Alloys[c]	13	-	2.3	-
Tin & Aluminum Brasses[c]	11.8	10.3	2.1	1.8
Plain & Leaded Brasses[c]	11.6	10	2.1	1.8
Silver[c]	10.9	-	2.0	-
Cr-Ni-Fe Superalloys[d]	10.5	9.2	1.9	1.7
Heat Resistant Alloys (cast)[d]	10.5	6.4	1.9	1.1
Nodular or Ductile Irons (cast)[c]	10.4	6.6	1.9	1.2
Stainless Steels (cast)[d]	10.4	6.4	1.9	1.1
Tin Bronzes (cast)[c]	10.3	10	1.8	1.8
Austenitic Stainless Steels[c]	10.2	9	1.8	1.6
Phosphor Silicon Bronzes[c]	10.2	9.6	1.8	1.7
Coppers[c]	9.8	-	1.8	-

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Nickel-Base Superalloys[d]	9.8	7.7	1.8	1.4
Aluminum Bronzes (cast)[c]	9.5	9	1.7	1.6
Cobalt-Base Superalloys[d]	9.4	6.8	1.7	1.2
Beryllium Copper[c]	9.3	-	1.7	-
Cupro-Nickels & Nickel Silvers[c]	9.5	9	1.7	1.6
Nickel & its Alloys[d]	9.2	6.8	1.7	1.2
Cr-Ni-Co-Fe Superalloys[d]	9.1	8	1.6	1.4
Alloy Steels[d]	8.6	6.3	1.5	1.1
Carbon Free-Cutting Steels[d]	8.4	8.1	1.5	1.5
Alloys Steels (cast)[d]	8.3	8	1.5	1.4
Age Hardenable Stainless Steels[d]	8.2	5.5	1.5	1.0
Gold[c]	7.9	-	1.4	-
High Temperature Steels[d]	7.9	6.3	1.4	1.1
Ultra High Strength Steels[d]	7.6	5.7	1.4	1.0
Malleable Irons[c]	7.5	5.9	1.3	1.1
Titanium Carbide Cermet[d]	7.5	4.3	1.3	.8
Wrought Irons[c]	7.4	-	1.3	-
Titanium & its Alloys[d]	7.1	4.9	1.3	.9
Cobalt[d]	6.8	-	1.2	-
Martensitic Stainless Steels[c]	6.5	5.5	1.2	1.0
Nitriding Steels[d]	6.5	-	1.2	-
Palladium[c]	6.5	-	1.2	-
Beryllium[b]	6.4	-	1.1	-
Chromium Carbide Cermet[c]	6.3	5.8	1.1	1.0
Thorium[b]	6.2	-	1.1	-
Ferritic Stainless Steels[c]	6	5.8	1.1	1.0

Gray Irons (cast)[c]	6	-	1.1	-
Beryllium Carbide[d]	5.8	-	1.0	-
Low Expansion Nickel Alloys[c]	5.5	1.5	1.0	.3
Beryllia & Thoria[e]	5.3	-	.9	-
Alumina Cermets[d]	5.2	4.7	.9	.8
Molybdenum Disilicide[c]	5.1	-	.9	-
Ruthenium[b]	5.1	-	.9	-
Platinum[c]	4.9	-	.9	-
Vanadium[b]	4.8	-	.9	-
Rhodium[b]	4.6	-	.8	-
Tantalum Carbide[d]	4.6	-	.8	-
Boron Nitride[d]	4.3	-	.8	-
Columbium & its Alloys	4.1	3.8	.7	.68
Titanium Carbide[d]	4.1	-	.7	-
Steatite[c]	4	3.3	.7	.6
Tungsten Carbide Cermet[c]	3.9	2.5	.7	.4
Iridium[b]	3.8	-	.7	-
* Alumina Ceramics[c]	3.7	3.1	.7	.6
Zirconium Carbide[d]	3.7	-	.7	-
Osmium and Tantalum[b]	3.6	-	.6	-
Zirconium & its Alloys[b]	3.6	3.1	.6	.55
Hafnium[b]	3.4	-	.6	-
Zirconia[e]	3.1	-	.6	-
Molybdenum & its Alloys	3.1	2.7	.6	.5
Silicon Carbide[e]	2.4	2.2	.4	.39
Tungsten[b]	2.2	-	.4	-

Electrical Ceramics[c]	2	-	.4	-
Zircon[c]	1.8	1.3	.3	.2
Boron Carbide[e]	1.7	-	.3	-
Carbon and Graphite[c]	1.5	1.3	.3	.2

(* or mm/mm)
[a]Values represent high and low sides of a range of *typical* values.
[b]Value at room temperature only.
[c]Value for a temperature range between room temperature and 212-750° F/100-390° C.
[d]Value for a temperature range between room temperature and 1000-1800° F/540-980° C.
[e]Value for a temperature range between room temperature and 2200-2875° F/1205-1580°.C.

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